1. GENERAL

1.1 Quality Assurance

.1 Welding materials, fabrication standards and labour qualifications must conform to ANSI/ASME B31.1, ANSI B16.25, ASME Section IX, and the Provincial Board of Labour Regulations latest current editions.

.2 Use welders fully qualified and licensed by Provincial Authorities.

.3 Gas Piping: CAN/CSA-B149.1, Natural Gas and Propane Installation Code (latest edition).

.4 Non-specified pipe joining and pipe fitting methods such as T-drill and press fit are not permitted in any piping system covered under Division 23.

2. PRODUCTS

2.1 Pipe

	Service	Material
.1	Heat exchanger water supply and miscellaneous vents:	Steel, Sch.40, ASTM A53, Grade B. Type L hard copper.
.2	Heat exchanger discharge	Steel, Sch.40, ASTM A53, Grade B
.3	Natural gas	Steel, Sch.40, ASTM A53, Grade B
.4	Equipment drains and overflows	Sch.40, steel, ASTM A53, Grade B Type L hard copper ASTM B88M
.5	Lubricating oil	Steel, Sch.40, ASTM A120
.6	Compressed air	Type L hard copper, ASTM B88M, brazed joints with Silverphos 15 AWS BCuP or 56% silver AWS BAg-7. Steel Sch.40, galvanised, ASTM A120 (for pipes over 65 mm dia.)
.7	Engine exhaust.	Steel, Sch.40, ASTM A53 Grade B.
.8	Engine combustion air piping	Sch.40 PVC to CSA-B137

2.2 Fittings and Joints

	Service	Material	Joint
.1	Water service, supply and return – steel	Maleable iron or steel.	Screwed (to 50mm) and flanged (over 50mm)
		Wrought copper,	95-5 solder, brazed bronze, for pipes over 50 mm
.2		Cast brass	Screwed
.3			
.4	Natural Gas	Steel, Sch 80 less than 50mm. Same schedule as pipe, for sizes 50 mm and larger:	Welded / flanged
.5	Lube Oil	Malleable iron, banded, 1033 kPa (150 psi) to 50mm.	Screwed
		Forged steel, socket weld	Welded
		Steel, same schedule as pipe	Welded
.6	Compressed air	Wrought copper or cast brass	Silverphos 15 AWS or Silver AWS BAg-7
.7	Engine exhaust	Steel, same schedule as pipe, all sizes	Welded
.8	Engine Combustion Air	PVC – All sizes – Sch40	Solvent welded.

.9 Use factory fabricated butt welded fittings for welded steel pipes.

.10 Use long radius elbows for all piping.

2.3 Unions, Flanges and Couplings

.1 Size 50 mm and under: 1033 kPa (150 psi) malleable iron, bronze to iron ground joint unions for threaded ferrous piping, air tested for gas service, all bronze for copper piping.

.2 Sizes 65 mm and over: 1033 kPa (150 psi) forged steel welding neck flanges for ferrous piping, 1033 kPa (150 psi) bronze slip-on flanges for copper piping. Gaskets shall be 1.5 mm (1/16 in) thick performed synthetic rubber bonded asbestos. Gaskets for gas service shall be synthetic rubber.

.3 Flange bolting: For systems up to 120°C (250°F), use carbon steel stud bolts, semi-flushed and heavy hex nuts, ASTM A307-GrB. For systems over 120°C (250°F), use alloy steel bolts ASTM A193-GrB7, and semi-finished heavy hex nuts ASTM A194-Gr2H.

3. EXECUTION

3.1 Preparation

.1 Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

.2 Protect all steel pipes when stored on site from external conditions and ensure protective coating remains intact. If in the opinion of the Consultant, deterioration of the protective coating has instigated corrosion, all rust must be removed down to bare metal and prime coated with red oxide paint.

3.2 Connection

.1 Screw joint steel piping up to and including 50 mm. Weld piping 65 mm and larger, including branch connections. Screw or weld 50 mm piping for liquid systems, weld 50 mm piping for air and gas systems.

.2 Make screwed joints with full cut standard taper pipe threads with approved non-toxic joint compound applied to male threads only.

.3 Make joints for plain end pipe with gasket and clamp type mechanical fastener.

.4 Make connections to equipment, specialty components, and branch mains with unions or flanges.

.5 Provide dielectric type connections wherever joining dissimilar metals in open systems. Brass adapters and valves are acceptable.

3.3 Route and Grades

.1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations. Install concealed pipes close to the building structure to keep furring to a minimum.

.2 Slope water piping 0.2% and provide hose bibb drains at low points.

.3 Equip low points with 20 mm drain valves and hose nipples.

.4 Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting.

.5 Grade horizontal drainage and vent piping 2% minimum, unless noted otherwise.

3.4 Installation

.1 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.2 Provide clearance for proper installation of insulation and for access to valves, drains and unions.

3.5 Welded Pipe Branch Connections

.1 Make branch connections according to the following schedule.

Legend:

T: Forges tee or reducing tee

S: Socolet

W: Weldolet

HEADER PIPE SIZE (mm)	15	20	25	30	40	50	65	75	100	150	200	250	300
15	T												
20	T	T											
25	T	T	T										
30	T	T	T	T									
40	T	T	T	T	T								
50	S	S	S	T	T	T							
65	S	S	S	S	T	T	T						
75	S	S	S	S	S	T	T	T					
100	S	S	S	S	S	T	T	T	T				
150	S	S	S	S	S	W	T	T	T	T			
200	S	S	S	S	S	W	W	W	T	T	T		
250	S	S	S	S	S	W	W	W	W	T	T	T	
300	S	S	S	S	S	W	W	W	W	W	T	T	T

BRANCH PIPE SIZE (mm)

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and components for metering steam and chilled/hot water including installation.

1.2 REFERENCES

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section CW1110 - General Instructions.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section CW1110 - General Instructions.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section CW1110 - General Instructions.

.3 Submittals to include:

.1 Piping configuration and sizing - straight pipe upstream and downstream, distances to first weld, protrusion, thermowell, pressure tap.

.2 Service conditions.

.3 Full details of primary element - standard of design and construction, materials, type serial number, flow rate, differential pressure, irrecoverable head loss (IHL), calculation sheets.

.4 Accuracy statements for each component at specified flow rates and other conditions.

.5 Flow and temperature ranges.

.6 Signal processor calibration data.

.7 Minimum turndown ratio.

.4 Samples:

.5 Quality assurance submittals: submit following in accordance with Section CW1110 - General Instructions.

.1 Instructions: submit manufacturer's installation instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

Part 2 Products

2.1 HOT WATER AND COOLANT METERING

.1 Temperature metering:

.2 Design data:

.1 Coolant and cooling water- Temperature range to suit engine Manufacturers recommendations or same as City water supply.

.2 City supply water: 0 to 115C (32F to 239F)

.3 Maximum accuracy of complete meter installation at normal design flow and design temperatures to be plus or minus 3%.

.4 Temperature sensors:

.1 Thermometers:

.1 Winters 228mm (9 inch) , 0-115 C (32- 239 F), Valox Case , 9IT Series or Approved Equivalent.

.2 Thermowells to NPS 3/4 stainless steel thermowell filled with conductive paste with following insertion lengths:

.1 Up to NPS 6: 75 mm.

.2 Winters 9IT or Approved Equivalent.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Clean readout and instrument as required.

END OF SECTION

1. GENERAL

1.1 Scope

.1 Gate valves.

.2 Globe or angle valves.

.3 Ball valves.

.4 Check valves.

.5 Butterfly valves.

.6 Drain valves.

.7 Strainers.

1.2 Manufacturer

.1 Provide valves of the same type by the same manufacturer throughout.

.2 Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

1.3 Shop Drawings

.1 Submit copies of valves "ordering schedule" for review before ordering valves.

.2 Submit detailed shop drawings clearly indicating make, model, size, pressure rating, materials of construction and intended service.

2. PRODUCTS

2.1 Water Systems

.1 Ball Valves up to 50 mm: Brass body, chrome plated brass ball, threaded or solder ends, TFE seat and packing. 4134 kPa (600 psi) non-shock WOG rating. Threaded, Red-White Fig. 5044A. Solder joint, Red-White Fig. 5049A.

.2 Globe Valves up to 50 mm: Bronze body, screw over bonnet, threaded ends rating 1035 kPa (150 psi) steam, solder ends rating 2070 kPa (300 psi) water. Threaded, Red-White Fig. 221. Solder ends, Red-white Fig. 222.

Globe Valves 65 mm and over: Cast iron body, flanged ends, OS&Y, renewable bronze seat ring, renewable composition disc. Rating 860 kPa (125 psi) steam. 1380 kPa (200psi). Red-White Fig. 400.

.3 Butterfly Valves: Cast iron wafer full-lug body, 300 Series stainless steel shaft, bronze disc, replaceable EPDM seat, lever lock handle operator with multiple position lock plate for valve sizes to 100 mm, heavy duty gear handwheel operator with position indicator for valve sizes 150 mm and over. Minimum rating 1200 kPa (175 psi), 121°C (250°F). Keystone AR2.

.4 Gate Valves up to 50 mm: Bronze body, inside screw, travelling stem, solid wedge, screw-in bonnet, threaded ends rating 860 kPa (125 psi) steam, solder ends rating 1380 kPa (200 psi) water. Threaded, Red-White Fig. 293. Solder ends, Red-White Fig. 299.

Gate Valves 65 mm and over: Cast iron body, bronze trim, OS&Y, rising stem, solid wedge, flanged ends, rating 860 kPa (125 psi) steam. Red-White Fig. 421.

.5 Swing Check Valves up to 50 mm: Bronze body, screw-in cap, replaceable disc, 860 kPa (125 psi) steam rating. Threaded, Red-White Fig. 236. Solder ends, Red-White Fig. 237.

Swing Check Valves 65 mm and over: Cast iron body, regrind-renew swing check, bolted cover, flanged ends, bronze disc and seat ring, rating 860 kPa (125 psi) steam. Red-White Fig. 435.

2.2 Engine Coolant Service

.1 Ball Valves up to 50 mm: Brass body, chrome plated brass ball, threaded or solder ends, TFE seat and packing. 4134 kPa (600 psi) non-shock WOG rating. Threaded, Red-White Fig. 5044A. Solder joint, Red-White Fig. 5049A.

.2 Globe Valves up to 50 mm: Bronze body, screw over bonnet, threaded ends rating 1035 kPa (150 psi) steam, solder ends rating 2070 kPa (300 psi) water. Threaded, Red-White Fig. 221. Solder ends, Red-white Fig. 222.

Globe Valves 65 mm and over: Cast iron body, flanged ends, OS&Y, renewable bronze seat ring, renewable composition disc. Rating 860 kPa125 psi steam. 1380 kPa200 psi water. Red-White Fig. 400.

.3 Butterfly Valves: Cast iron wafer full-lug body, 300 Series stainless steel shaft, bronze disc, replaceable EPDM seat, lever lock handle operator with multiple position lock plate for valve sizes to 100 mm, heavy duty gear handwheel operator with position indicator for valve sizes 150 mm and over. Minimum rating 1200 kPa (175 psi), 121°C (250°F). Keystone AR2.

.4 Gate Valves up to 50 mm: Bronze body, inside screw, travelling stem, solid wedge, screw-in bonnet, threaded ends rating 860 kPa (125 psi) steam, solder ends rating 1380 kPa (200 psi) water. Threaded, Red-White Fig. 293. Solder ends, Red-White Fig. 299.

Gate Valves 65 mm and over: Cast iron body, bronze trim, OS&Y, rising stem, solid wedge, flanged ends, rating 860 kPa (125 psi) steam. Red-White Fig. 421.

.5 Swing Check Valves up to 50 mm: Bronze body, screw-in cap, replaceable disc, 860 kPa (125 psi) steam rating. Threaded, Red-White Fig. 236. Solder ends, Red-White Fig. 237.

Swing Check Valves 65 mm and over: Cast iron body, regrind-renew swing check, bolted cover, flanged ends, bronze disc and seat ring, rating 860 kPa (125 psi) steam. Red-White Fig. 435.

.6 Drain Valves up to 50 mm: Brass 2 piece body ball valve, blowout proof stem, Teflon seats, forged brass chrome palted ball, hose end connection with cap and chain by male IP, 4200 kPa (600 psi) water, oil, gas rating, Red-White Fig. 5046.

2.3 Natural Gas Systems

.1 Ball valves up to 50 mm: Class 125 non-lubricated ball valves suitable for outdoor use, brass body, CGA approved Section 3.16 threaded ends, Kitz Fig. #68 , Toyo 5044A, MAS B3, or Approved Equivalent.

.2 Ball valves 65 mm and larger: Flanged, carbon steel body, stainless steel trim, lever operated, Teflon seats and seals. CGA approved, Kitz Fig. 150SCT-BZM or Approved Equivalent.

2.4 Valve Operators

.1 Provide suitable hand wheels for gate, globe or angle, and drain valves.

.2 Provide valves larger than 100 mm located more than 2100 mm from floor in equipment rooms with chain operated sheaves. Extend chains to 1500 mm above floor and hook to clips to arrange to clear walking aisles.

2.5 Strainers

.1 Size 50 mm and under: Screwed brass or iron body, Y pattern with 0.75 mm (24 ga) stainless steel perforated screen.

.2 Size 65 mm to 100 mm: Flanged iron body, Y pattern with 1 mm (20 ga) stainless steel perforated screen.

.3 Size 125 mm and larger: Flanged iron body, Y pattern with 3 mm (11 ga) stainless steel perforated screen.

.4 Screen free area shall be minimum three times area of inlet pipe.

3. EXECUTION

3.1 Installation and Application

.1 Install valves with stem upright or horizontal, not inverted.

.2 Provide drain valves at main shut-off valves, low points of piping and apparatus and terminal units.

.3 Size drain lines and drain valves equal to size of apparatus drain connection.

.4 For pipe sizes 20 mm and over, minimum drain size to be 20 mm.

.5 Provide male NPT nipples with threaded pipe cap for drain sizes over 20 mm where not piped directly to floor drains.

.6 Provide valved drain and hose connections off the bottom of all strainers.

END OF SECTION